

RESEARCH ARTICLE

A profile of Latinos with poorly controlled diabetes in South Florida

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Introduction: Latinos are the largest minority group in the United States and diabetes or pre-diabetes affects more than 70% of Latinos aged 45 years and older. Miami-Dade County is home to one of the highest populations of diverse Latinos. In this descriptive manuscript, we present baseline characteristics of participants enrolled in the Miami Healthy Heart Initiative (MHHI). This was a study conducted to determine the effects of a community health worker (CHW) intervention among Latinos with poorly controlled diabetes in South Florida.

Methods: We recruited 300 diverse Latino adults with suboptimal diabetes outcomes ($HbA1c \geq 8$) into MHHI. This randomized control trial examined the impact of a 1-year CHW-led intervention on glycemic control, blood pressure, and cholesterol levels. At baseline, physiologic measures, including HbA1c, LDL, blood pressure, and BMI, were assessed. Data on socio-demographic characteristics and additional determinants of health such as depression status, provider communication, diet, exercise, cigarette smoking, readiness to change diabetes management behaviors (stages of change), and confidence in ability to improve diabetes self-care (self-efficacy) were collected.

Results: Participants came from 20 different countries, with Cuban Americans representing 38% of the sample. Most had lived in the US for more than 10 years, had completed at least 12 years of school, and had high levels of health literacy, yet 48% had very low acculturation. Nearly 80% had poor self-efficacy, 80% met the criteria for depression, and 83% were not adherent to their medications. More than half the population was not at their target for blood pressure, 50% were above the recommended LDL goal, and most were obese.

Conclusion: In a diverse population of Latinos with poorly controlled diabetes in Miami, we found high rates of depression, obesity, medication non-adherence, poor self-efficacy, and provider communication. These may contribute to poor diabetes control, high blood pressure, and elevated cholesterol.

Keywords: *diabetes among Latinos; South Florida; diabetes disparities; Hispanics with diabetes*

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Latinos are the largest minority group in the United States (US) (1). By 2060, it is projected that nearly one in three persons in the US will be Latino (1). The incidence and prevalence of diabetes in this population is more than double that of non-Hispanic whites (2). Recent data from the Hispanic Community Health Study found that more than 70% of Hispanics aged 45 years and older have diabetes or pre-diabetes (3). With 64% of residents in Miami-Dade County being Latino (4), the county has one of the highest concentrations of Latinos in the US. In addition, with a rapid influx of Central and South

Americans, South Florida is also rapidly becoming one of the most diverse Latino populations in the country (5, 6).

In this descriptive study, we provide an overview of a heterogeneous group of Latinos coming from a multitude of Latin American countries with poorly controlled diabetes, being cared for at the largest public hospital system in South Florida. We describe baseline characteristics of 300 Latino adults who were enrolled in a randomized study and provide data on physiologic measures, as well as socio-demographic, behavioral, and diabetes-specific constructs.

Methods

The Miami Healthy Heart Initiative (MHHI) is a National Institutes of Health/National Heart, Lung and Blood Institute–sponsored randomized clinical trial (R01 HL083857) examining the impact of a 1-year community health worker (CHW)–led intervention on glycemic control, blood pressure, and cholesterol levels among 300 Latinos with poorly controlled diabetes.

Participants and measures

The methodology for MHHI has been previously described (7). In brief, all participants were recruited from the primary care clinics of Jackson Health System which is in the Miami-Dade County public hospital system. Participants were identified by review of electronic health records and some by provider referral. Inclusion criteria included being between the ages of 30 and 60, having had diabetes for at least 6 months, and having their last hemoglobin A1c (HbA1c) done within the past year and being ≥ 8 indicating poor glycemic control. Following study enrollment, participants completed a baseline intake that included systolic blood pressure (SBP) measured as per American Heart Association guidelines (8), phlebotomy for HbA1c and low-density lipoprotein (LDL) cholesterol determinations, body mass index, and a comprehensive 90-min patient interview including socio-demographic characteristics as well as behavioral and diabetes-specific measures collected using validated instruments (Table 1).

Upon completion of these assessments, participants were randomized to a control or intervention group. Culturally relevant diabetes education materials were sent monthly to control group participants. Intervention group participants received 12 months of personalized support from a Latino CHW, who provided individualized diabetes management education, accompaniment to medical and social service appointments, and linkages to other relevant healthcare resources. Throughout the study, CHWs made an average of 5 home visits, 22 phone calls, and accompanied intervention participants to 1.28 clinic appointments.

Data analysis

Physiologic and questionnaire data were entered into a password protected Excel database. Data entry was reviewed for accuracy by a separate research assistant and exported into SPSS software, prior to analysis. Characteristics of the population involving categorical variables were examined using frequencies. Means and standard deviations were calculated for continuous variables. The study was approved by the University of Miami Institutional Review Board and is registered in clinicaltrials.gov (NCT01152957).

Results

Demographics

The 300 Latino participants represented diverse Hispanic ethnicities. Persons born in Cuba made up approximately 38% of our sample and the rest came from a large variety of regions of Latin America, including at least 10 persons born in Nicaragua, Colombia, Dominican Republic, Puerto Rico, Peru, and the mainland United States. The others were from a large variety of countries, including Puerto Rico, Mexico, Dominican Republic, Ecuador, Columbia, Guatemala, Peru, Brazil, Argentina, Venezuela, and Honduras. Most participants (80%) had been living in the US for more than 10 years. With respect to race, four-fifths self-identified themselves as White (81%); 16% indicated their race was either ‘moreno’, ‘mixto’, ‘indigeno’, or another variation; and 3% identified their race as Black (Table 2). Acculturation level, the process of adapting to a new culture, was assessed using the Marin Short Acculturation Scale (MSAS) (10), which primarily focuses on the linguistic components of acculturation. The MSAS has six questions using a Likert scale and respondents can have a total acculturation score ranging from 6 to 30. The total acculturation score was calculated for each participant. Then, based on frequency distributions, we grouped respondents into acculturation tertiles to indicate minimal acculturation, low acculturation, or moderate acculturation. The lowest possible score was 6, and participants who met that criteria were categorized as minimally acculturated. Acculturation status among those who scored between 7 and 10 was categorized as low, and those who scored between 11 and 30 met the criteria for moderate. Most of the sample scored minimal on acculturation with 48% achieving the lowest score possible and less than a quarter meeting the criteria for moderate acculturation. However, nearly 60% had completed at least 12 years of schooling (usually in their home country). Health literacy, which was measured using the Spanish version of the Short Assessment of Health Literacy Spanish and English (SAHL S&E), was relatively high with 85% having adequate health literacy, an understanding of common medical terminology.

Physiologic measures

To be eligible for the study, participants had to have their diabetes under relatively poor control with their last HbA1c being ≥ 8 . During our review of the electronic medical record, which was completed when identifying potential participants for study inclusion, the mean HbA1c among the sample was 9.31. However, at the time participants had their initial measurement for MHHI, usually done a few months after the initial HbA1c, the mean A1C had dropped to 9.13.

With respect to blood pressure, the mean SBP was $133 \text{ mmHg} \pm 19$. Based on existing ADA criteria at the

Table 1. Validated Assessments administered at baseline

Measures	Scale name	Description
Socio-demographic		
Health literacy	Short Assessment of Health Literacy Spanish and English (SAHLS&E) (9)	This scale uses 18 items to assess participant’s understanding of common medical terminology.
Acculturation	Marin Short Acculturation Scale (10)	This 12-item scale was developed for Hispanics highly correlated with length of US residency, age at arrival, ethnic self-identification, and respondent’s generation.
Behavioral		
Depression	European depression-D (11)	This 12-item EURO-D scale asks participants about factors such as appetite, tearfulness, irritability, and trouble sleeping, among others. Response categories are dichotomous.
Alcohol intake	Alcohol Use Disorders Identification Test (AUDIT-C) (12)	This three item screening instrument is used to help providers identify patients who are hazardous drinkers or have active alcohol use disorders.
Cigarette smoking		Participants were asked if they currently smoke.
Diet	Behavioral Risk Factor Surveillance System: Fruit and Vegetable Intake (13)	The dietary intake section was used to measure the number of fruits and vegetables they consume daily as well as how many times a week they consume breakfast.
Physical activity	International Physical Activity Questionnaire (I-PAQ) (14)	This 4-item scale assesses the time spent doing moderate or vigorous activity, walking, or sitting. Participants are then placed in low, medium or high category.
Health measures		
Adherence to medication	Morisky Medication Adherence Scale (15)	This 8-item scale addresses adherence issues like forgetfulness or discontinuing medication because it makes patients feel better or worse. Response categories are yes/no for each item with a dichotomous response.
Behavioral change	Stages of Change (16)	Participants’ response placed them in one of the following categories: precontemplation, contemplation, preparation, action, or maintenance.
Diabetes self-efficacy	The Diabetes Distress Scale (17)	This 2-item scale measures two potential problem areas for people living with diabetes. The items are on a 6 point gradient scale.
Provider communication	Medical Care Scale from the Stanford Patient Education Center (18)	The scale consists of three measures with responses on a five-point gradient scale. Scale items address preparation for clinic appointments and discussions of confusion and personal problems related to patient’s illness.

After the mean and SD were calculated for the health measures above, the variables were recoded to reduce responses into more meaningful categories. For example, provider communication was recoded into a dichotomous variable. ‘Sometimes, almost never, or never’ were combined into a single category and ‘fairly often, very often, and always’ were also combined. In addition, the stages of change measure includes five response categories (precontemplation, contemplation, preparation, action, and maintenance) and we reduced the response categories by combining the precontemplation and contemplation phases into one response category and action and maintenance into another response category, and preparation remained a single category, reducing the potential responses into three possibilities.

time of the study, the target blood pressure was under 130 (19), which meant that more than half the population was not at their target for blood pressure. Using the newer criteria of SBP <140 (19), almost a third of participants were not at goal. In addition, mean LDL was 105 ± 40, indicating that 52% were above the existing ADA goal of LDL <100 (9). The population was also predominantly obese with a mean body mass index (BMI) of 32 ± 7 (BMI ≥ 30 is considered obese).

Behavioral measures

With respect to behavioral measures, the most notable finding was depression. Using the EURO-D cut-off of 3 or greater, 80% of participants screened positive for depression and more than half had scores of five or greater indicating high levels of mental health impairment. Other behavioral measures were also notable including 55% of the patients being sedentary and on average consuming only two servings of fruits and vegetables per day. Though

Table 2. Demographics and health outcomes

Demographics	<i>N</i> (%)
Sex	
Male	135 (45)
Female	165 (55)
Age	55.25 ± 7.02
Race	
White	242 (80.5)
Black	8 (3)
Other	47 (15.5)
Refused to answer	3 (1)
Adequate Health Literacy	255 (85)
Income < \$1,200 per month	127 (49)
% Uninsured	81%
Physiologic measures	Mean (SD)
HbA1c	9.31 (1.99)
LDL	105.01 (39.67)
Systolic blood pressure	133.00 (18.92)
Diastolic blood pressure	77.14 (10.24)
BMI	32.26 (7.41)

this is well below national recommendations, these rates mirror the national rates of fruit and vegetable consumption (20). Some findings were encouraging. For example, most participants ate breakfast more than 5 days per week. In addition, hazardous alcohol use was less than 190 3% versus the national rate of 7% (21). Only 15% of participants were current smokers, compared to national rates of 18% (22).

Diabetes-related measures

Another problematic area was with respect to medication adherence. Using the Morisky Medication Adherence (15) scale, a score of < 6 was classified as low adherence, a score of 6 to 7 was considered medium adherence, and a score of 8 was considered high adherence. In our population, only 16% had high adherence to their medications. Self-efficacy scores, as measured by the brief diabetes distress scale (DDS 2), also indicated another problem area. The DDS 2 is a diabetes distress screening instrument asking respondents to rate on a 6-point scale, the degree to which the following items caused distress: 1) feeling overwhelmed by the demands of living with diabetes and 2) feeling that, 'I am often failing with my diabetes regimen'. A DDS 2 score of ≥ 3 indicates a moderate or more severe problem. DDS 2 scores are tabulated by adding the numbers (1 through 6) assigned to each response category in the Likert scale and then dividing the sum by 2 (i.e., 8/2 = 4). Nearly 80% of our sample met the criteria for moderate to serious distress, as indicated by the sample's mean score of 4.06 (Table 3). Encouraging were our findings with respect to stages of change with 70% of the sample being in the preparation, action, or maintenance phase.

Another area for opportunity was with respect to communication with providers. More than a quarter of these patients with poorly controlled diabetes indicated that they 'never' or 'almost never' communicated with their provider about health issues and just 10% communicated with their provider 'very often' or 'always' regarding their health concerns. Lastly, we examined whether any of these characteristics, including depression, self-efficacy, readiness to change (stages of change), and medication adherence, were correlated with A1c. However, in bivariate analysis we did not find any significant correlations with A1c. Though, a major limitation of this approach is that all participants had poorly controlled diabetes, a more appropriate strategy would have been to compare the distribution of characteristics among MHHI participants with another sample of people with well-controlled diabetes.

Discussion

In this manuscript, we describe a heterogeneous population of Latinos from various countries of origin in Miami with poorly controlled diabetes. We found that despite having poor diabetes control and being predominantly obese, two-thirds of our sample had their blood pressure controlled as per the revised ADA guidelines, and half were at the existing target for LDL control. Although there is still considerable room for improvement, these metrics from a public hospital low income population are similar to NHANES data among a nationally representative sample, which shows that 53% of a nationally representative sample had poor blood pressure in New York City (≥ 130/80) and 41% had poor total cholesterol (≥ 200) (23). When these findings were discussed with several of our providers, they were also surprised, as they expected a higher proportion of participants to have poorly controlled blood pressure and cholesterol. Though our findings on fruit and vegetable consumption and physical activity are not different from the general population, these areas warrant improvement and demonstrate specific opportunities for behavioral intervention.

The most concerning findings were with respect to depression. Several other studies (24, 25), including our own prior research of Latinos in the northeast (26), have also found high rates of depression among those with diabetes. However, in our study, 80% of the population screened positive for depression, which is much higher than the 52% we previously reported (25) and the 30% cited in other studies. Previous research has shown that depressed individuals with diabetes have medical costs nearly five times greater than those without depression and that co-treating both conditions can decrease health-care costs (27–29). Several approaches, such as the collaborative care model, have been shown to successfully treat both depression and glucose management (27–29). Our data again reiterate the importance of assessing depression

Table 3. Health status indicators

Scales	Mean (SD)	Categorical (dichotomous)
Health care behaviors		
Communication with doctor	2.14 (1.13)	62% never, almost never, or sometimes communicated with PCP
Range 1 (never) through 5 (always)		
Morisky medication adherence	5.65 (1.75)	83% did not meet criteria for adherent
Range 0 (non-adherence) through 8 (adherent)		
Psychological measures		
Depression	5.62 (3.2)	80% met criteria for depression
Range 0 (not depressed) through 12 (depressed)		
Diabetes distress	4.06 (1.52)	79% met criteria for moderate to serious distress
Range 1 (not distressed) through 6 (distressed)		
Positive competence	2.84 (0.41)	42% (as measured by Diabetes Self-Efficacy Scale)
Range 1 (low self-efficacy) through 4 (high self-efficacy)		
Negative dietary competence	2.77 (0.47)	92% (as measured by Diabetes Self-Efficacy Scale)
Range 1 (high dietary self-efficacy through 4 (low dietary self-efficacy)		
Stages of change		N (%)
1. Precontemplation or contemplation		92 (30)
2. Preparation		92 (31)
3. Action or maintenance		116 (39)
Health behaviors		Mean (SD)
Daily fruit consumption		1.13 (1.0)
Daily vegetable consumption		1.40 (1.0)
Weekly breakfast consumption		5.68 (2.4)
IPAQ physical measurement		N (%)
Low		166 (55)
Moderate		77 (26)
High		57 (19)
Smoking		45 (15)
Hazardous alcohol		38 (13)

among patients with diabetes and linking depressed patients with effective treatments.

We also found that 83% of our patients did not have appropriate medication adherence. In addition, self-efficacy scores suggested that many participants felt overwhelmed or that they were failing in diabetes management. Prior studies have shown that improving self-efficacy may lead to better glycemic control (30). One strategy to address these barriers is the use of motivational interviewing, which has been shown as an effective tool, to improve medication adherence among people with diabetes and other chronic conditions (31, 32). Because most patients also reported difficulties with provider communication, this is an additional area warranting attention. However, we also found that, with respect to stages of change, 40% of our sample met the criteria to be in the action or maintenance phase. This finding is supported by the fact that even prior to enrollment in the study, the mean HbA1c of our patients improved, suggesting that many participants were at least taking

some action to control their diabetes. Voluntarily enrolling into a clinical trial focused on improving diabetes management may also indicate progression along the stages of change continuum and readiness to change their diabetes self-care behaviors.

Among the strengths of our study was a highly diverse Latinos population. However, our sample was from South Florida and may not be generalized to Latino populations in other geographic regions of the country, which tend to be more homogenous in ethnicity. Second, as only poorly controlled diabetics were enrolled into our study, the findings reported here are not representative of the national population of patients with diabetes, or all Latinos with diabetes. Estimates are that about half the patients with diabetes have HbA1c < 7.0 (33). Lastly, there are numerous planned future manuscripts based on our data, including the impact of the intervention on diabetes, blood pressure, and LDL. Other manuscripts will examine data on acculturation on outcomes and health care utilization.

In summary, we found that in a large sample of heterogeneous Latinos with poorly controlled diabetes and obesity in Miami, levels of blood pressure and cholesterol control were similar to other studies of less impaired patients with diabetes. Many behavioral measures such as diet, exercise, smoking, and alcohol also mirrored data from non-diabetics. However, there were several areas that warrant attention, including high rates of depression, medication non-adherence, and provider communication. These are all important domains to consider in improving care delivery to this vulnerable population with poorly controlled diabetes.

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Conflict of interest and funding

The authors have not received any funding or benefits from industry or elsewhere to conduct this study.

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